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Applicant(s): George Robert Hood
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 RELATIONAL DATABASE MANAGEMENT SYSTEM

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We are transmitting herewith the attached:

- ☒ Transmittal sheet, in duplicate, containing Certificate Of Mailing Under 37 CFR 1.10.
- ☒ Utility Patent Application: Spec. 23 pgs; 33 claims; Abstract 1 pg(s).
 The fee has been calculated as shown below in the "Claims as Filed" table.
- ☒ 3 sheets of Drawings
- ☒ A signed Declaration and Power of Attorney
- ☒ Assignment of the invention to NCR Corporation, Recordation Form Cover Sheet
- ☒ A charge to Deposit Account in the amount of \$924.00 to cover the Filing Fee
- ☒ A charge to Deposit Account in the amount of \$40.00 to cover the Assignment Recordation Fee.
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed	In Excess of:	Number Extra	Rate	Fee
Basic Filing Fee				\$690.00
Total Claims				
33	20	13	x \$18.00	= \$234.00
Independent Claims				
3	3	0	x \$78.00	= \$0.00
MULTIPLE DEPENDENT CLAIM FEE				\$0.00
TOTAL FILING FEE				\$924.00

Please charge all fees to Deposit Account No. 14-0225 of NCR Corporation (the assignee of the present application).
 A duplicate of this sheet is enclosed.

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DIRECT EXPENSE IMPLEMENTATION FOR FINANCIAL PROCESSING IN A
RELATIONAL DATABASE MANAGEMENT SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

5 This application is related to the following co-pending and commonly assigned
patent applications:

Application Serial No. 09/---,---, entitled "BASIC AND INTERMEDIATE NET
INTEREST REVENUE IMPLEMENTATION FOR FINANCIAL PROCESSING IN A
RELATIONAL DATABASE MANAGEMENT SYSTEM," filed on same date herewith,
10 by George Robert Hood and Paul Phibbs, attorney's docket number 8980;

Application Serial No. 09/---,---, entitled "ADVANCED AND
BREAKTHROUGH NET INTEREST REVENUE IMPLEMENTATION FOR
FINANCIAL PROCESSING IN A RELATIONAL DATABASE MANAGEMENT
SYSTEM," filed on same date herewith, by George Robert Hood and Paul Phibbs,
15 attorney's docket number 9006;

Application Serial No. 09/---,---, entitled "OTHER REVENUE
IMPLEMENTATION FOR FINANCIAL PROCESSING IN A RELATIONAL
DATABASE MANAGEMENT SYSTEM," filed on same date herewith, by George Robert
Hood, attorney's docket number 9015;

20 Application Serial No. 09/---,---, entitled "INDIRECT EXPENSE
IMPLEMENTATION FOR FINANCIAL PROCESSING IN A RELATIONAL
DATABASE MANAGEMENT SYSTEM," filed on same date herewith, by George Robert
Hood, attorney's docket number 9008; and

Application Serial No. 09/---,---, entitled "RISK PROVISION
IMPLEMENTATION FOR FINANCIAL PROCESSING IN A RELATIONAL
DATABASE MANAGEMENT SYSTEM," filed on same date herewith, by George Robert
Hood, attorney's docket number 9011; and

5 all of which are incorporated by reference herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates in general to financial processing systems performed by
10 computers, and in particular, to the implementation of "direct expense" calculations for
financial processing using data accessed from a relational database management system.

2. Description of Related Art.

Financial processing systems provide tools for financial analysis of accounting data.
15 Typically, each financial processing system operates in a unique way and approaches financial
analysis differently. Some financial processing systems are advanced in their approach to
profitability calculations, and others are still at a more basic level. In addition, there is no
agreement as to the rules for profitability calculations, outside of generally accepted
accounting policies that external auditors use.

20 Yet, the majority of financial processing systems attempt to use profitability
calculations to differentiate between sources of revenues and expenses. There is a need,
then, for a flexible approach to profitability calculations in terms of the overall metric, as
well as the type of data used.

SUMMARY OF THE INVENTION

A Value Analyzer is a data-driven computer-facilitated financial processing system that accesses account, event and organization attributes from a relational database management database, wherein: (1) the account attributes comprise data about accounts
5 being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status. Profitability calculations are performed using the account, event and organization attributes accessed from the relational database management system, as well as one or more profit factors and one or more rules. The profitability calculations include the following:

$$\begin{aligned} 10 \quad \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

- 15 In this calculation, the Direct Expense (DE) comprises expenses driven by events that are attributable to accounts.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings in which like reference numbers represent
20 corresponding parts throughout:

FIG. 1 illustrates an exemplary hardware and software environment according to the preferred embodiment of the present invention;

FIG. 2 is a data flow diagram that illustrates the operation of the Value Analyzer according to the preferred embodiment of the present invention; and

FIG. 3 is a flow chart illustrating the steps necessary for the execution of Profitability Calculations according to the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 In the following description of the preferred embodiment, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration a specific embodiment in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

10

OVERVIEW

The Value Analyzer is a data-driven computer-facilitated financial model that provides accurate and consistent profitability calculations using account, event and organization data stored in a relational database management system (RDBMS), wherein: (1) 15 the account attributes comprise data about accounts being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status. The profitability calculations performed by the Value Analyzer rely on a Five Factor Atomic Profit Metric (FFAPM):

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \\ &= \text{NIR} + \text{OR} - \text{DE} - \text{IE} - \text{RP} \end{aligned}$$

20

In the above equation, it is assumed that the sign of elements that reduce profit are negative and those that contribute are positive.

Each of the five factors of FFAPM are defined below:

- 5 • Net Interest Revenue. This component comprises interest revenue, and is the largest component of profitability (e.g., from loans, deposits, cash, etc.).
- Other Revenue. This component comprises non-interest revenue (e.g., fees and commissions), including those driven by events (e.g., open account, excessive counter withdrawals, early payout penalties, etc.).
- 10 • Direct Expense. This component comprises expenses driven by events that are attributable to accounts.
- Indirect Expense. This component comprises expenses that are not attributable to specific accounts. This includes expenses that relate to the cost of doing business that are not driven by account or event activity, such as those that arise from overheads, inefficiencies or differences between
- 15 standard and actual costs (e.g., the CEO's salary, etc.).
- Risk Provision. This component comprises the expected cost of risks that arise from the uncertainties of doing business, e.g., market risks, customer credit, competition, operations, regulatory risks, political risks, etc.

Each of these five factors can be measured for a desired period (daily, weekly, 20 monthly, quarterly, etc.). Moreover, each factor is essentially discrete and independent with fundamentally different characteristics, which strengthens the user's ability to fully utilize the output to determine relationships between account, event and organization data, and enable consistent multiple dimensional aggregation.

The FFAPM is “atomic” in that profitability is computed using data stored in a relational database management system (RDBMS). There are three aspects to this:

- components of profitability may be measured below the account level (at events which make up account activity over an accounting period) and accumulated to the account,
- components of profitability may be measured directly at the account level (such as interest paid or earned for an accounting period),
- components of profitability may be known, obtained, or aggregated at a higher level, and may be apportioned down to specific accounts and events according to various rules.

The Value Analyzer generally defines “indirect” components of profitability to be those which must be apportioned to accounts and “direct” components to be those which are either computed at the account level, or are rolled up to the account level from lower level events.

HARDWARE AND SOFTWARE ENVIRONMENT

FIG. 1 illustrates an exemplary hardware and software environment according to the preferred embodiment of the present invention. In the exemplary environment, a computer system 100 implements a financial processing system in a three-tier client-server architecture, wherein the first or client tier provides a Value Analyzer Client 102 that may include, inter alia, a graphical user interface (GUI), the second or middle tier provides a Value Analyzer Calculation Engine 104 for performing profitability calculations as described later in this application, and the third or server tier comprises a Relational DataBase Management system

(RDBMS) 106 that stores the data and metadata necessary for performing the profitability calculations from the data and metadata stored in a relational database. The first, second, and third tiers may be implemented in separate machines, or may be implemented as separate or related processes in a single machine.

5 In the preferred embodiment, the Value Analyzer Client 102 and the Value Analyzer Calculation Engine 104 together are referred to as the Value Analyzer. Generally, the Value Analyzer Client 102 includes a graphical user interface (GUI) for operators of the system 100, wherein requests are transmitted to the Value Analyzer Calculation Engine 104 and responses are received therefrom. The Value Analyzer Calculation Engine 104 performs the
10 profitability calculations and other processing, including commands or functions for performing various search and retrieval functions in the RDBMS 106, wherein queries are transmitted to the RDBMS 106 as requests and tuples are received therefrom as responses. The Value Analyzer Client 102 and the Value Analyzer Calculation Engine 104 may be implemented in separate machines, or may be implemented as separate or related processes
15 in a single machine.

 In the preferred embodiment, the RDBMS 106 includes at least one Parsing Engine (PE) 108 and one or more Access Module Processors (AMPs) 110A-110E storing the relational database in one or more data storage devices 112A-112E. The Parsing Engine 108 and Access Module Processors 110 may be implemented in separate machines, or may be
20 implemented as separate or related processes in a single machine. The RDBMS 106 used in the preferred embodiment comprises the Teradata® RDBMS sold by NCR Corporation, the assignee of the present invention, although other DBMS's could be used.

 In the preferred embodiment, the system 100 may use any number of different parallelism mechanisms to take advantage of the parallelism offered by multiple Access

Module Processors 110. Further, data within the relational database may be fully partitioned across all data storage devices 112 in the system 100 using hash partitioning or other partitioning methods.

Generally, the Value Analyzer Client 102, Value Analyzer Calculation Engine 104, RDBMS 106, Parsing Engine 108, and/or Access Module Processors 110A-110E comprise logic and/or data tangibly embodied in and/or accessible from a device, media, carrier, or signal, such as RAM, ROM, one or more of the data storage devices 112A-112E, and/or a remote system or device communicating with the computer system 100 via one or more data communications devices.

However, those skilled in the art will recognize that the exemplary environment illustrated in FIG. 1 is not intended to limit the present invention. Indeed, those skilled in the art will recognize that other alternative environments may be used without departing from the scope of the present invention. In addition, it should be understood that the present invention may also apply to components other than those disclosed herein.

VALUE ANALYZER DATA FLOW

FIG. 2 is a data flow diagram that illustrates the operation of the Value Analyzer Calculation Engine 104 according to the preferred embodiment of the present invention. Within the Value Analyzer Calculation Engine 104, one or more Profitability Calculations 200 accept a number of inputs including Account Attributes 202, Event Attributes 204, Organization Attributes 206, and Profit Factors 208. Thereafter, the Profitability Calculations 200 invoke one or more Rules 210 that generate the FFAPM 212, which in turn are used to create the Database 212. The Database 212 may be represented along account,

event, or organization dimensions, or along other dimensions as may be required. These elements are described in more detail below.

Input Definitions

5 Account Attributes 202 comprise data about the accounts being measured. This data includes: balance, rate (or interest accrued), product identification, limits, expected default frequency, and various dates (e.g., open, rate reset, last payment, next payment, maturity, etc.).

 Event Attributes 204 comprise data about account-related events or transactions.

10 This data includes: account identification, event or transaction amounts, event or transaction location, event or transaction time, counter-party identification, event or transaction type (e.g., loan payment, interest paid, loan draw down amount, etc.).

 Organization Attributes 206 comprise data about the financial status of the organization. This data includes: balance sheet and profit statement amounts aggregated by
15 the legal or management entities that own the account base being measured.

 Profit Factors 208 include parameter values necessary to perform the Profitability Calculations 200. The major classifications of this data include:

- Funds transfer rates are pricing methods that require matched maturity opportunity rates for use in valuing each account's marginal use or source of
20 internal funds.
- Unit costs are used for Direct Expense calculations, where a total cost is provided as an Organization Attribute 206 and the Unit Cost is then derived by dividing total cost by actual volume. Unit Costs can be either standard,

actual, or market, and ideally represent marginal values (if “fully absorbed measures” are used, then the usefulness of allocated amounts is diminished.)

- Allocated amounts are used in both Other Revenue and Indirect Expense calculations, wherein the allocated amounts are apportioned amongst all accounts in a group.
- Miscellaneous calculation values may comprise, for example, the number of days in a profit measurement period, an equity allocation weighting, etc. These values are known as “modeling” parameters.
- Amortization parameters are used in interest amortization, which requires interest rates and life values used by straight line amortization and by declining balance of amortization.
- Risk measurement parameters are used in Risk Provision calculations, which require various factors, such as: loss rates, reserve percentages, exposure factors, recovery rates, default probabilities and collection costs.
- Tax rates are required for after-tax profit calculation. The Value Analyzer is designed to calculate pre-tax income on a taxable equivalent basis (where an effective tax rate is all that is required to transform pre-tax income into after tax earnings, i.e., Profit).

Rules

The Profitability Calculations 200 use one or more Rules 210 applied to data retrieved from the RDBMS 106. These Rules 210 include, inter alia, the following:

Treatments. Every account with cash flows affecting a organization's balance sheet requires a method of valuing the account's use of internal funds. One approach is "matched maturity funds transfer pricing," which uses a canonical representation of an account's funding characteristics and then determines a value based on adjusted market yields for each instance that requires an interest rate transfer price to calculate an account's marginal Net Interest Revenue.

Equity Allocation. In order to provide precise Net Interest Revenue calculations, the amount of equity funds required at an account must be determined. This rule allows for equity allocation using any of the following methods: simple ratios; regulatory definitions; economic allocations, or user defined allocations.

Apportionment. Other Revenue, Risk Provision and Indirect Expense calculations are applied at the account level using Organization Attributes 206 that are not related directly to account activity. These profit adjustments are made so that the sum of all account-level Profitability Calculations 200 comprises the overall profit. One approach is to pool indirect costs and revenues and then apportion them. Apportionment rules specify how the pooled indirect costs and revenues is completely allocated to appropriate accounts, wherein the preferred embodiment uses closed form allocation rules, which require only information known in the current period and not iterative computation.

Amortization. Some types of income or expense are deferred or accrued over multiple periods, including and subsequent to the current accounting period. This is common to accrual accounting methods used in profit presentations of financial statements, and gives rise to timing differences between cash flows and their related profit as presented in a financial statement in any accounting period. Since the Value Analyzer is designed to reconcile to the financial statement's profit values, it supports deferral and accrual

accounting principles. Amortization methods that account for these timing differences are: interest amortization (used for interest income and expense accruals and for deferral of fees that are in lieu of interest), and straight line or declining balance amortizations (used for cost deferrals and investment depreciation).

- 5 Other Revenue Pricing. In situations where account and event activity can be used to derive account level income or fees, the Value Analyzer calculates these drivers of the profitability in the Other Revenue calculations. These calculations comprise linear combinations of event or account values and modeled coefficients.

- 10 Direct Expense. The calculation of account profit adjustments due to account-related activity requires rules that take the form of linear combinations of event or account values and modeled coefficients.

- 15 Indirect Expense. In situations where expense apportionment or amortization amounts are aggregated, the user may want different rules applied depending on the path (or dimension) of aggregation. These rules allow for multiple profit calculations rules to be applied to derive multiple account level Indirect Expense amounts.

- 20 Risk Provision. Adjusting current profit for expected future losses is known as “actuarial” profit provisioning. The Value Analyzer applies actuarial-based methods in its account level profit calculations, where the actuarial reserve that the provisions maintain represents the expected loss associated with all accounts.

- 20 Taxable Equivalent Gross-up. Profit is an after-tax measure, and thus some events or portions of some accounts’ profits may be excluded from normal taxation. The Value Analyzer adjusts these pre-tax values, so that a singular tax rate can be used to convert pre-tax profit into after-tax values, which are also known as taxable equivalent adjustment.

These rules use account and event attributes to adjust each of the five factors of the FFAPM to a taxable equivalent basis.

Interest Yield Adjustments. Since the Value Analyzer can calculate profits for any number of periods, the adjustment of cash interest payments, and the financial statement's
5 accrual or smoothed representation of interest-related Profit, the Value Analyzer provides a method for converting cash interest amounts to accrual amounts for financial statements. The Value Analyzer implements an "effective interest rate" conversion to accomplish this type of calculation.

10 Profitability Calculations

The following describes the method used by the Profit Calculations 200:

1. Retrieve data from the RDBMS 106.
2. Calculate Net Interest Revenue for every account.
3. Calculate Other Revenue for every account.
- 15 4. Calculate Direct Expense for every account.
5. Calculate Indirect Expense for every account.
6. Calculate Risk Provision for every account.
7. Calculate Profit for every account.
8. Store the FFAPM Profit and the five factors of FFAPM into the RDBMS
- 20 106.
9. Aggregate and/or re-calculate the FFAPM Profit and the five factors of FFAPM as necessary.

Note that steps 2 through 6 perform account-level calculations. Steps 2, 3, 4, 5, and 6 can be performed independently and in parallel, while step 7 requires values derived in

steps 2, 3, 4, 5, and 6, and therefore must be performed after steps 2, 3, 4, 5, and 6 are completed.

Output Definition

- 5 The Profit Calculations 200 generate one or more values for the five factors of the FFAPM 210, and specifically, the NIR, OR, DE, IE, RP, and Profit values. These values are used to generate the output data 214, which can be stored by the RDBMS 106 in the relational database.

10 Analytic Variations

The Value Analyzer operates on data and calculations across a continuum, in order to provide the analytic variations necessary for financial processing at various levels of aggregation. This continuum is comprised of multiple tiers as described below:

basic - >intermediate - >advanced - >breakthrough.

- 15 Not every tier is necessarily present for each element of data or every calculation.

- This continuum embodies the notion of inheritance, wherein the data and calculations of the higher tiers embody the data and calculations of the lower tiers. The principle of inheritance means that the data and calculations by which the separate tiers are defined are nested, i.e., the definition of “intermediate” includes the definition of “basic,”
- 20 but with added functionality that goes beyond “basic,” and so on. Thus, there is consistency in the data and calculations performed at the different tiers in the continuum.

Direct Expense

As noted above, Direct Expense (DE), also known as variable expense, comprises the costs that are driven by events that are reflected in the account. In this sense, Direct Expense is aggregated from the event level to the account level. This is in contrast to

5 Indirect Expense, which is disaggregated from higher levels down to the account level via apportionment rules.

The Direct Expense for an account is calculated using a unit cost for an event, applying the unit costs to each of the events of an account, and adding these unit costs over a specified period. For example, every time a withdrawal, deposit, enquiry, transfer, or

10 similar event is performed on an account, there is an associated cost.

In addition, the location, channel device, and time of the event have an impact on the cost to be allocated. For example, an “over the counter” transaction is generally more costly than an ATM transaction, and a transaction performed at a city branch may be more costly than a transaction performed at a suburban branch. This transaction behavior is a

15 major differentiator of value between accounts, and thereby of customers.

There are three approaches to identifying the unit costs that the Value Analyzer uses in the calculation of Direct Expense: (1) estimated unit costs, (2) actual unit costs, or (3) implicit state, all of which are described below.

20 Estimated Unit Costs

One approach of the Value Analyzer is to use estimated or pre-calculated unit costs as determined by the organization, and to apply these costs at an event level to determine the Direct Expense associated with the account. The Value Analyzer generally captures unit costs from external sources, such as a Financial Statement. On the other hand, if the

organization does not have direct unit costs, industry standard costs may be used, or all costs can be pooled and allocated as Indirect Expenses, although this is an inferior approach.

An example of how the unit cost is used to calculate Direct Expense is provided in the following description. Assume: (a) a teller takes 2 minutes for a cash withdrawal, (b) the teller is idle 50% percent of the time, (c) the teller's direct labor costs are \$12 per hour, and (d) indirect overhead costs are twice the direct labor cost. Using these assumptions, the standard cost of a cash withdrawal is:

$$\begin{aligned} &= \text{work minutes} * \text{idleness burden} * \text{cost per minute} * (\text{labor} + \text{overhead}) \\ &= (2 \text{ min}) * (100\% / 50\%) * (\$12/60 \text{ min}) * (1+2) \\ &= \$2.40. \end{aligned}$$

The Value Analyzer also allows the option of using planned or budgeted Financial Statement costs as unit costs. These are calculated from a Financial Statement.

Actual Unit Costs

This approach involves using actual or historical (post facto) unit costs as derived from the Financial Statement, assuming the Financial Statement supports event level costing. Event level costing breaks the Financial Statement costs down into individual event related cost drivers. This approach is generally used only by those organizations that generate the necessary process-oriented Financial Statements.

Once the actual event level volume is known, the unit cost is calculated as total cost divided by the event level volume. This superior approach eliminates the event level volume variances from periodic changes in unit costs, and the total Direct Expense agrees with Financial Statement costs for periods from which the historical data are drawn.

The Value Analyzer also allows for the use of detailed budgets in deriving unit costs, as well as actual Financial Statements. This results in an alternate profitability measure, one based both on estimated as well as actual unit costs. This profitability measure can be used as a measure of performance against plan (e.g., goal assessment).

5

Direct Expense Matrix

Following is an exemplary Direct Expense matrix, wherein the results of the process are shown, with each row representing an account A, each column representing an event E, and each cell representing the corresponding Direct Expense DE. The column totals represent the total Direct Expenses associated with a given event type, while the row totals are the Direct Expenses associated with each account.

	E ₁	E ₂	***	E _m	Totals
A ₁					DE(A ₁)
A ₂					DE(A ₂)
A ₃					DE(A ₃)
***			DE _{AiEj}		***
A _n					DE(A _n)
Totals	DE(E ₁)	DE(E ₂)	***	DE(E _m)	DE

where:

15

$$DE(E_i) = \sum_k DE_{AkEi}$$

and:

$$DE(A_i) = \sum_k DE_{AiEk}$$

Note that this matrix is usually sparse, since there may be many accounts, but it is likely that each account has a relatively small number of events associated with it.

Direct Expense in the Intermediate Tier

- 5 Following are the inputs and outputs of the calculation of Direct Expense in the Intermediate Tier:

<u>Inputs</u>	<u>Outputs</u>
Unit Cost _{event-type}	Direct Expense for each event-type and for each account
FunctionType Flag	

- In the Intermediate Tier, unit costs are supplied to the Value Analyzer, and the
- 10 Direct Expense is assigned to accounts based on events or other crediteria. In the preferred embodiment, the assignment is performed using one of three rules:
- (1) the event has a unit cost associated with it,
 - (2) the event has an amount associated with it, which is based on an event value in the database that can be used to derive a cost (such as a title fee on a mortgage, etc.), or
 - 15 (3) the event requires a specified function (e.g., broker fees as a % of account balance).

Of course, other rules may be developed and used as required.

- The organization identifies which of the three types of rules to apply to each event in the Value Analyzer. For each of these rules, there is a different calculation for the Direct
- 20 Expense related to the event, which may be based on a fixed unit cost or on a variable unit cost that depends on volume of activity for the account in question.

Generally, the calculations are made in the following order: (1) allocation of fixed costs to the event type, (2) allocation of variable costs per event type, (3) calculation of unit costs using a ratio of total cost to volume for this account.

Thus:

$$\begin{aligned}
 5 \quad DE_{\text{account, event-type}} &= \text{rule 1 cost contributions} \\
 &+ \text{rule 2 cost contributions} \\
 &+ \text{rule 3 cost contributions} \\
 &= \text{unit cost}_{\text{event-type}} * (\# \text{ of events of this type in the period}) \\
 &+ \text{amounts associated with the event} \\
 10 \quad &+ \text{amounts from the specified function} \\
 &= (uc_{\text{event-type}}) * (count_{\text{event-type}})
 \end{aligned}$$

Then:

$$DE_{\text{account}} = \sum_{\text{event-type}} DE_{\text{account, event-type}}$$

where the summation is over all event-types.

Implicit State

In addition to using unit costs, another method of assessing Direct Expense is “implicit state” methodology. In this methodology, a cost can be assessed if an account is in a certain “state.”

20 Consider the following example. One common use of this methodology is to form a group of accounts that track mortgages. When created during a current processing cycle, these accounts are in a “new mortgage” state. When a particular account is in the “new mortgage” state, then the account is assessed the costs associated with opening the account,

including paperwork costs, underwriting costs, funding costs, etc. As a result, this Direct Expense is not triggered by events, but instead by states of the account.

LOGIC OF THE PREFERRED EMBODIMENT

5 FIG. 3 is a flow chart illustrating the steps necessary for the execution of Profitability Calculations 200 according to the preferred embodiment of the present invention. Those skilled in the art will recognize that this logic is provided for illustrative purposes only and that different logic may be used to accomplish the same results.

 Block 300 represents the Value Analyzer Client 102 invoking one or more
10 Profitability Calculations 200 in the Value Analyzer Calculation Engine 104.

 Block 302 represents the Value Analyzer Calculation Engine 104 invoking one or more scripts related to the invoked Profitability Calculations 200, wherein the scripts comprise SQL statements that are transmitted to the RDBMS 106. These SQL statements access account, event and organization attributes from the database managed by the RDBMS
15 106.

 Block 304 represents the Parsing Engine 108 of the RDBMS 106 receiving the SQL statements and transforming the statements into an operator tree.

 Block 306 represents the Parsing Engine 108 of the RDBMS 106 generating one or more access plans from the operator tree.

20 Block 308 represents the Parsing Engine 108 of the RDBMS 106 parallelizing the access plans, and then transmitting the access plans to their assigned Access Module Processors 110A-E of the RDBMS 106.

 Block 310 represents the Access Module Processors 110A-E of the RDBMS 106 performing the required data manipulation associated with the access plans received from

the Parsing Engine 108, wherein the access plans are performed in parallel by the Access Module Processors 110A-E.

Block 312 represents the Parsing Engine 108 of the RDBMS 106 merging the results received from the Access Module Processors 110A-E and providing the merged results to the Value Analyzer Calculation Engine 104 as account, event and organization attributes.

Block 314 represents the Value Analyzer Calculation Engine 104 performing the invoked Profitability Calculations 200 using the account, event and organization attributes accessed from the RDBMS 106, as well as one or more profit factors and one or more rules. In this Block, the Profitability Calculations 200 include:

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

wherein the Direct Expense (DE) comprises expenses driven by events that are attributable to accounts.

In Block 314, the Direct Expense for an account is calculated using a unit cost of an event, applying this unit cost to each of the events of an account, and adding these unit costs over a specified period. The unit costs may comprise estimated unit costs (e.g., derived from industry standards), or the unit costs may comprise actual unit costs (e.g., derived from the organization's financial statement), or the unit costs may comprise an implicit state (e.g., derived from an account's state).

In Block 314, the unit costs are derived by dividing a total cost by the event volume. Thereafter, the unit costs are aggregated from an event level to an account level, so that the

Direct Expense can be assigned to accounts based on events using one or more methods selected from a group comprising: (1) a unit cost multiplied by number of events, (2) an amount associated with each event, or (3) a specified function. In more complex calculations, the Direct Expense is calculated using: (1) allocation of fixed costs per event type, (2) allocation of variable costs per event type, and (3) calculation of unit costs using a ratio of total cost to event volume for the account.

Block 316 represents the Value Analyzer Calculation Engine 104 delivering the output or results from the invoked Profitability Calculations 200 to the Value Analyzer Client 102 and/or the RDBMS 106. With regard to the Value Analyzer Client 102, the results may be presented to the user, printed, or used by various other computer programs, as desired. With regard to the RDBMS 106, the results may be stored for later use by the Value Analyzer Calculation Engine 104, or other computer programs, as desired.

CONCLUSION

This concludes the description of the preferred embodiment of the invention. The following paragraphs describe some alternative embodiments for accomplishing the same invention.

In one alternative embodiment, any type of computer or configuration of computers could be used to implement the present invention. In addition, any database management system, decision support system, on-line analytic processing system, or other computer program that performs similar functions could be used with the present invention.

In summary, the present invention discloses a Value Analyzer, which is a data-driven computer-facilitated financial processing system that accesses account, event and organization attributes from a relational database management database, wherein: (1) the

account attributes comprise data about accounts being measured, (2) the event attributes
comprise data about account-related transactions, and (3) the organization attributes
comprise data about the organization's financial status. Profitability calculations are
performed using the account, event and organization attributes accessed from the relational
5 database management system, as well as one or more profit factors and one or more rules.
The profitability calculations include the following:

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ 10 &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

In this calculation, the Direct Expense (DE) comprises expenses driven by events that are
attributable to accounts.

The foregoing description of the preferred embodiment of the invention has been
15 presented for the purposes of illustration and description. It is not intended to be exhaustive
or to limit the invention to the precise form disclosed. Many modifications and variations
are possible in light of the above teaching. It is intended that the scope of the invention be
limited not by this detailed description, but rather by the claims appended hereto.

WHAT IS CLAIMED IS:

1. A method of performing financial processing in a computer, comprising:

(a) accessing account, event and organization attributes from a database accessible by the computer, wherein: (1) the account attributes comprise data about accounts being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status;

(b) performing one or more profitability calculations in the computer using the account, event and organization attributes accessed from the database, as well as one or more profit factors and one or more rules, wherein the profitability calculations include:

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

(c) wherein the Direct Expense comprises expenses driven by events that are attributable to accounts.

2. The method of claim 1, wherein the Direct Expense for an account is calculated using a unit cost of an event, applying this unit cost to each of the events of an account, and adding these unit costs over a specified period.

3. The method of claim 2, wherein the unit costs comprise estimated unit costs.

4. The method of claim 3, wherein the estimated unit costs are derived from

industry standards.

5. The method of claim 2, wherein the unit costs comprise actual unit costs.

5 6. The method of claim 5, wherein the actual unit costs are derived from the organization's financial statement.

7. The method of claim 2, wherein the unit cost is derived by dividing a total cost by the event volume.

10

8. The method of claim 2, wherein the Direct Expense (DE) comprises unit costs aggregated from an event level to an account level.

9. The method of claim 2, wherein the Direct Expense is assigned to accounts
15 based on events using one or more methods selected from a group comprising:

- (1) a unit cost multiplied by number of events,
- (2) an amount associated with each event, or
- (3) a specified function.

20 10. The method of claim 2, wherein the Direct Expense is calculated using: (1) allocation of fixed costs per event type, (2) allocation of variable costs per event type, and (3) calculation of unit costs using a ratio of total cost to event volume for the account.

11. The method of claim 2, wherein the Direct Expense is determined from a state of an account.

12. A system for financial processing, comprising:

5 a computer;

logic, performed by the computer, for:

(a) accessing account, event and organization attributes from a database accessible by the computer, wherein: (1) the account attributes comprise data about accounts being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status;

(b) performing one or more profitability calculations in the computer using the account, event and organization attributes accessed from the database, as well as one or more profit factors and one or more rules, wherein the profitability calculations include:

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

(c) wherein the Direct Expense comprises expenses driven by events that are attributable to accounts.

13. The system of claim 12, wherein the Direct Expense for an account is calculated using a unit cost of an event, applying this unit cost to each of the events of an account, and adding these unit costs over a specified period.

5 14. The system of claim 13, wherein the unit costs comprise estimated unit costs.

15. The system of claim 14, wherein the estimated unit costs are derived from industry standards.

10 16. The system of claim 13, wherein the unit costs comprise actual unit costs.

17. The system of claim 16, wherein the actual unit costs are derived from the organization's financial statement.

15 18. The system of claim 13, wherein the unit cost is derived by dividing a total cost by the event volume.

19. The system of claim 13, wherein the Direct Expense (DE) comprises unit costs aggregated from an event level to an account level.

20

20. The system of claim 13, wherein the Direct Expense is assigned to accounts based on events using one or more methods selected from a group comprising:

- (1) a unit cost multiplied by number of events,
- (2) an amount associated with each event, or

(3) a specified function.

21. The system of claim 13, wherein the Direct Expense is calculated using: (1) allocation of fixed costs per event type, (2) allocation of variable costs per event type, and (3) calculation of unit costs using a ratio of total cost to event volume for the account.

22. The system of claim 13, wherein the Direct Expense is determined from a state of an account.

23. An article of manufacture embodying logic for performing financial processing in a computer, comprising:

(a) accessing account, event and organization attributes from a database accessible by the computer, wherein: (1) the account attributes comprise data about accounts being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status;

(b) performing one or more profitability calculations in the computer using the account, event and organization attributes accessed from the database, as well as one or more profit factors and one or more rules, wherein the profitability calculations include:

$$\begin{array}{rcl} \text{Profit} & = & \text{Net Interest Revenue (NIR)} \\ & + & \text{Other Revenue (OR)} \\ & - & \text{Direct Expense (DE)} \\ & - & \text{Indirect Expense (IE)} \\ & - & \text{Risk Provision (RP)} \end{array}$$

(c) wherein the Direct Expense comprises expenses driven by events that are attributable to accounts.

24. The article of manufacture of claim 23, wherein the Direct Expense for an
5 account is calculated using a unit cost of an event, applying this unit cost to each of the events of an account, and adding these unit costs over a specified period.

25. The article of manufacture of claim 24, wherein the unit costs comprise
estimated unit costs.

10

26. The article of manufacture of claim 25, wherein the estimated unit costs are derived from industry standards.

15

27. The article of manufacture of claim 24, wherein the unit costs comprise
actual unit costs.

28. The method of claim 27, wherein the actual unit costs are derived from the organization's financial statement.

20

29. The article of manufacture of claim 24, wherein the unit cost is derived by dividing a total cost by the event volume.

30. The article of manufacture of claim 24, wherein the Direct Expense (DE) comprises unit costs aggregated from an event level to an account level.

31. The article of manufacture of claim 24, wherein the Direct Expense is assigned to accounts based on events using one or more methods selected from a group comprising:

- 5 (1) a unit cost multiplied by number of events,
 (2) an amount associated with each event, or
 (3) a specified function.

32. The article of manufacture of claim 24, wherein the Direct Expense is
10 calculated using: (1) allocation of fixed costs per event type, (2) allocation of variable costs per event type, and (3) calculation of unit costs using a ratio of total cost to event volume for the account.

33. The article of manufacture of claim 24, wherein the Direct Expense is
15 determined from a state of an account.

ABSTRACT OF THE DISCLOSURE

A financial processing system that accesses account, event and organization attributes from a relational database management database, wherein: (1) the account attributes comprise data about accounts being measured, (2) the event attributes comprise data about account-related transactions, and (3) the organization attributes comprise data about the organization's financial status. Profitability calculations are performed using the account, event and organization attributes accessed from the relational database management system, as well as one or more profit factors and one or more rules. The profitability calculations include the following:

$$\begin{aligned} \text{Profit} &= \text{Net Interest Revenue (NIR)} \\ &+ \text{Other Revenue (OR)} \\ &- \text{Direct Expense (DE)} \\ &- \text{Indirect Expense (IE)} \\ &- \text{Risk Provision (RP)} \end{aligned}$$

In this calculation, the Direct Expense (DE) comprises expenses driven by events that are attributable to accounts.

"Express Mail" mailing label number 2540749705
Date of Deposit JUNE 29, 2000
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to:
Assistant Commissioner for Patents, Washington, D.C. 20231.
SMITH M. COOPER
(printed name)
Steve Miller
(Signature)

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

my residence, post office address and citizenship are as stated below next to my name;

I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **DIRECT EXPENSE IMPLEMENTATION FOR FINANCIAL PROCESSING IN A RELATIONAL DATABASE MANAGEMENT SYSTEM** (Docket No. 9010), the specification of which

- ☒ is attached hereto.
- ☐ was filed on _____ as
Application Serial No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate or any PCT application having a filing date before that of the application on the basis of which priority is claimed: **None**

Prior Foreign Application(s)			Priority Claimed	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
				X

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application listed below: **None**

U.S. Provisional Application No. _____

Day/Month/Year Filed _____

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application: None

(Application Serial Number) (Filing Date) (Status) (Patented/Pending/Abandoned)

And I hereby appoint:

Douglas S. Foote of Dayton, Ohio, Registration No. 31,013, James M. Stover of Dayton, Ohio, Registration No. 32,759, Paul W. Martin of Dayton, Ohio, Registration No. 34,870, Michael Chan of Dayton, Ohio, Registration No. 33,663, Charlene Stukenborg of Dayton, Ohio, Registration No. 40,832, and John D. Cowart of San Diego, California, Registration No. 38,415, all of whom are attorneys with NCR Corporation, 101 W. Schantz Avenue, Dayton, Ohio 45479; and

George H. Gates of Los Angeles, California, Registration No. 33,500, Victor G. Cooper of Los Angeles, California, Registration No. 39,641, Anthony J. Orler of Los Angeles, California, Registration No. 41,232, Karen S. Canady of Los Angeles, California, Registration No. 39,927, William J. Wood of Los Angeles, California, Registration No. 42,236, and Jason S. Feldmar of Los Angeles, California, Registration No. 39,187, all of whom are attorneys with the law firm of Gates & Cooper, 6701 Center Drive West, Suite 1050, Los Angeles, California 90045;

as my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. I hereby expressly waive my right to revoke the Power of Attorney granted above.

Address all telephone calls to James M. Stover at telephone number 937/445-7663. Address all correspondence to James M. Stover, NCR Corporation, 101 W. Schantz Avenue, ECD-2, Dayton, Ohio 45479.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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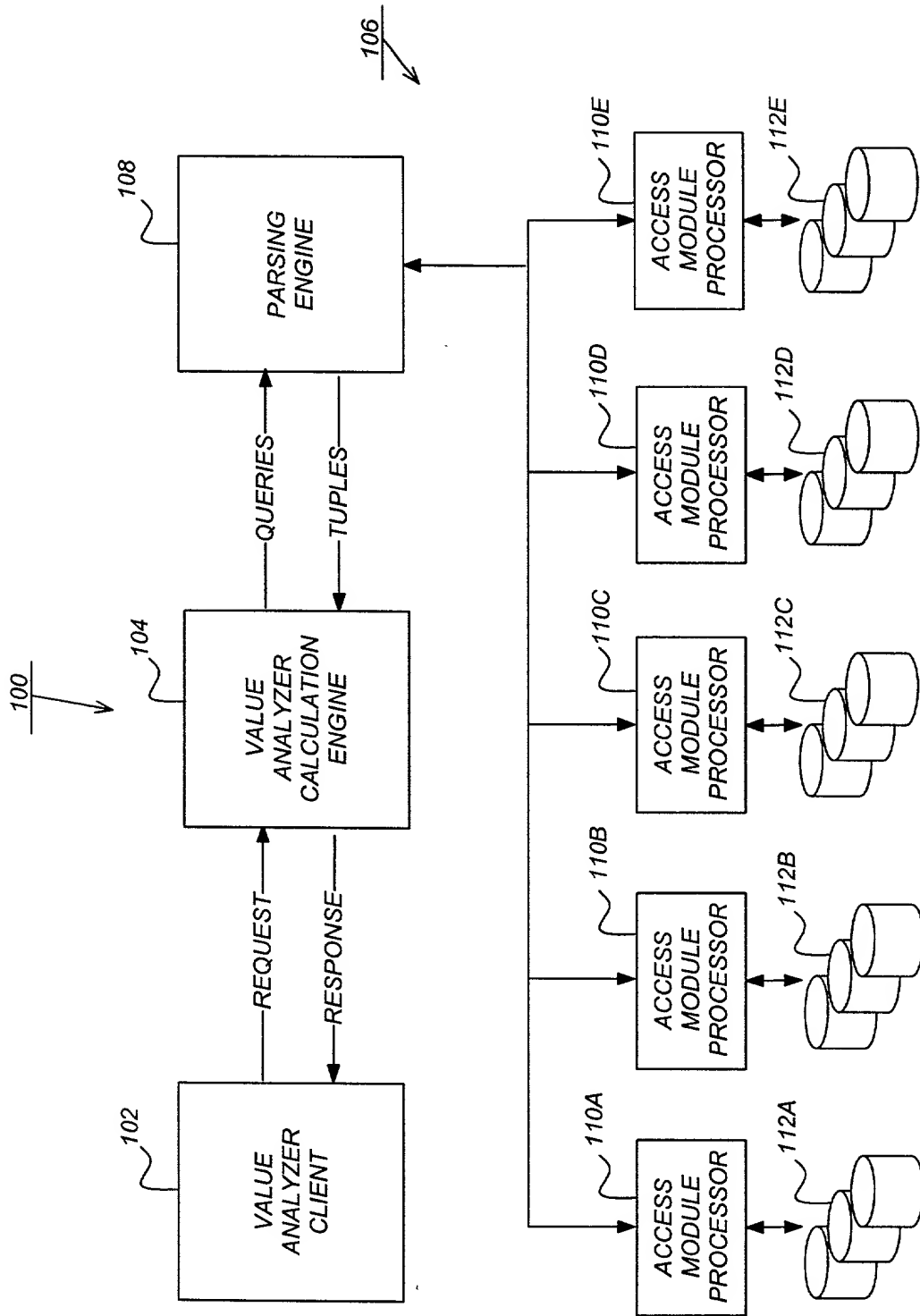


FIG. 1

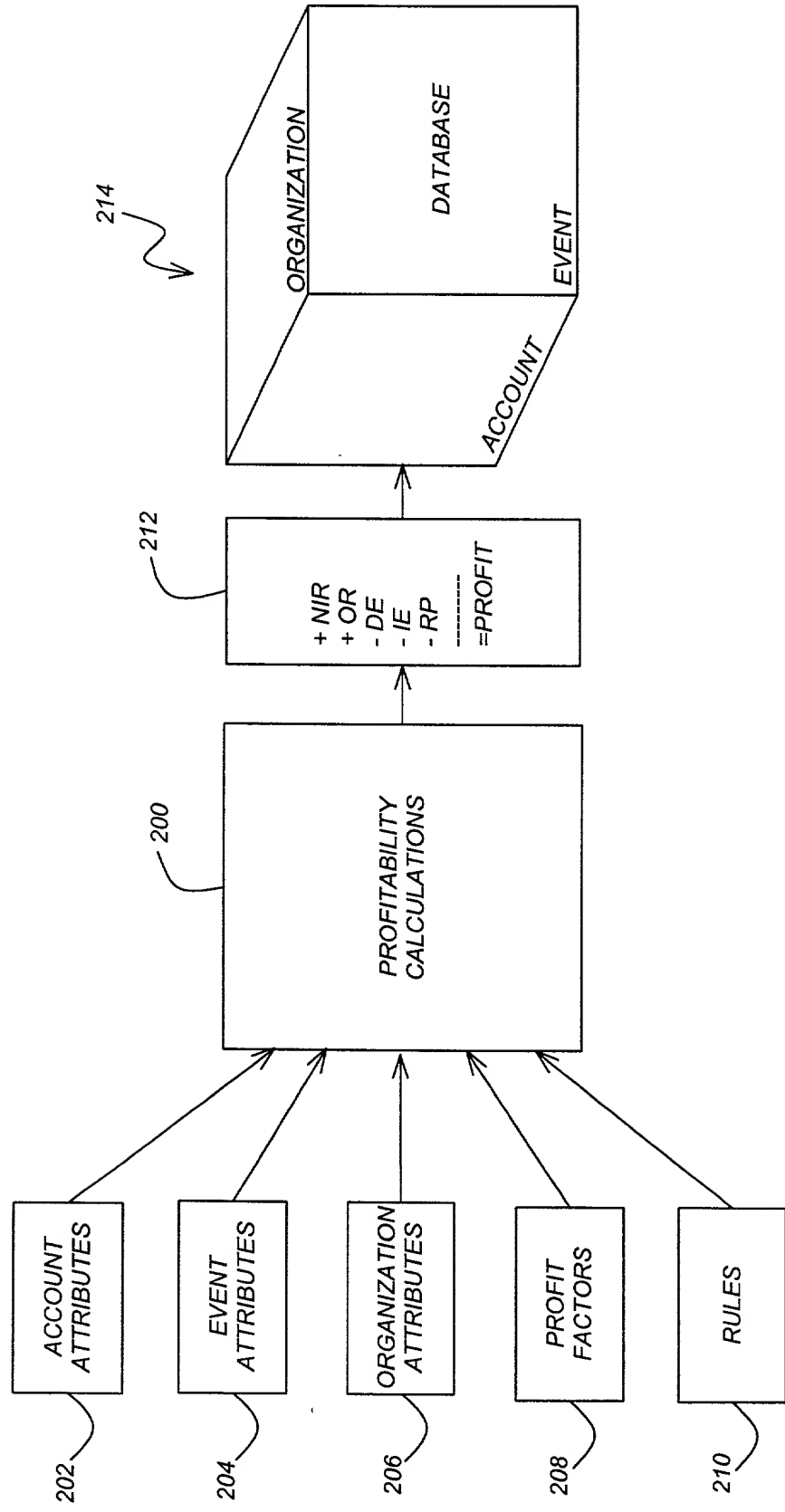


FIG. 2

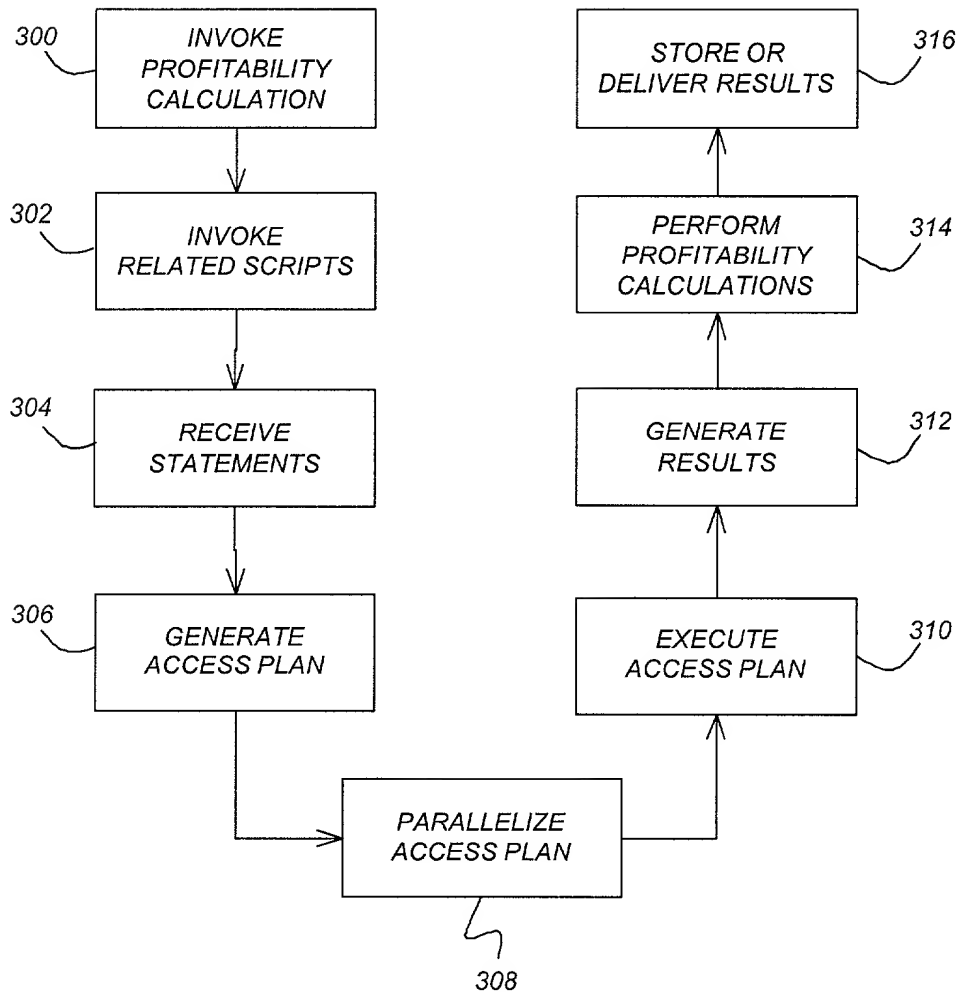


FIG. 3